Level instruments
Continuous level measurement - Ultrasonic transmitters

The Probe

Overview

The Probe is a short-range integrated ultrasonic level transmitter, ideal for liquids and slurries in open or closed vessels.

Benefits

- Easy to install, program and maintain
- Accurate and reliable
- Sanitary models available
- Patented Sonic Intelligence® echo processing
- Integral temperature compensation

Application

The transducer is available in PVDF copolymer, making the device suitable for use in a wide variety of applications. The Probe is easy to install and maintain, and can be quickly removed for cleaning as required by the food, beverage and pharmaceutical industries.

The reliability of the level data is based on the Sonic Intelligence echo processing algorithms. A filter discriminates between the true echo and false echoes from acoustic or electrical noises and agitator blades in motion. The ultrasonic pulse propagation time to the material and back is temperature-compensated and converted into distance for display, analog output and relay actuation.

- Key Applications: chemical storage vessels, filter beds, mud pits, liquid storage vessels, food applications

Configuration

Parabolic Mounting

Flat Mounting and Beam Angle

The Probe mounting
## Technical specifications

<table>
<thead>
<tr>
<th></th>
<th>Three-wire version</th>
<th>Two-wire version (standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode of operation</strong></td>
<td>Ultrasonic level measurement</td>
<td>Ultrasonic level measurement</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring range</td>
<td>0.25 to 5 m (0.8 to 16.4 ft)</td>
<td>0.25 to 5 m (0.8 to 16.4 ft)</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• mA</td>
<td>4 to 20 mA</td>
<td>4 to 20 mA</td>
</tr>
<tr>
<td>- Span</td>
<td>Proportional/inversely proportional</td>
<td>Proportional/inversely proportional</td>
</tr>
<tr>
<td>- Max. load</td>
<td>750 Ω at 24 V DC</td>
<td>600 Ω in the loop at 24 V DC</td>
</tr>
<tr>
<td>• Relay</td>
<td>For level alarm or fault</td>
<td>No</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Supply voltage</td>
<td>18 to 30 V DC, max. 0.2 A</td>
<td>12 to 28 V DC, 0.1 A surge</td>
</tr>
<tr>
<td>• Max. power consumption</td>
<td>5 W (200 mA at 24 V DC)</td>
<td>0.75 W (25 mA at 24 V DC)</td>
</tr>
<tr>
<td><strong>Certificates and approvals</strong></td>
<td>CE, C-TICK, CSAUS/C, FM</td>
<td>CE, C-TICK, CSAUS/C</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Error in measurement</td>
<td>0.25 % of measuring range (in air)</td>
<td></td>
</tr>
<tr>
<td>• Resolution</td>
<td>3 mm (0.125&quot;)</td>
<td></td>
</tr>
<tr>
<td>• Temperature compensation</td>
<td>Built in</td>
<td></td>
</tr>
<tr>
<td>• Echo processing</td>
<td>Sonic Intelligence</td>
<td></td>
</tr>
<tr>
<td><strong>Rated operation conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Beam angle</td>
<td>12°</td>
<td></td>
</tr>
<tr>
<td>• Ambient temperature</td>
<td>-40 to +60 °C (-40 to +140 °F)</td>
<td></td>
</tr>
<tr>
<td>- Standard</td>
<td>-40 to +60 °C (-40 to +140 °F)</td>
<td></td>
</tr>
<tr>
<td>- Metallic mounting</td>
<td>-20 to +60 °C (-4 to +140 °F)</td>
<td></td>
</tr>
<tr>
<td>• Max. static operating pressure</td>
<td>Normal atmospheric pressure</td>
<td></td>
</tr>
<tr>
<td>• Degree of protection</td>
<td>IP65</td>
<td></td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Weight</td>
<td>1.5 kg (3.3 lbs)</td>
<td>1.7 kg (3.7 lbs)</td>
</tr>
<tr>
<td>- Without flange adapter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- With flange adapter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Electronics enclosure</td>
<td>PVC</td>
<td></td>
</tr>
<tr>
<td>- Transducer</td>
<td>PVDF copolymer</td>
<td></td>
</tr>
<tr>
<td>• Degree of protection</td>
<td>IP65</td>
<td></td>
</tr>
<tr>
<td>• Process connection</td>
<td>2&quot; NPT [Taper], ANSI/ASME B1.20.1</td>
<td>2&quot; NPT locknut, plastic</td>
</tr>
<tr>
<td>- Standard</td>
<td>2&quot; BSPT, EN 10226</td>
<td>2&quot; BSPT locknut, plastic</td>
</tr>
<tr>
<td>- Metallic mounting</td>
<td>G 2&quot; [BSPP], EN ISO 228-1</td>
<td>Plastic M20 cable gland with metal locknut</td>
</tr>
<tr>
<td>• Flange adapter</td>
<td>3&quot; Universal, (fits DN 65, PN 10 and 3&quot; ASME)</td>
<td>SITRANS RD100 Remote display - see RD100 on page 5/304</td>
</tr>
<tr>
<td>- Sanitary</td>
<td>4&quot; sanitary</td>
<td>SITRANS RD200 Remote display - see RD200 on page 5/306</td>
</tr>
<tr>
<td>• Cable inlet</td>
<td>2 inlets for PG 13.5 or ½&quot; NPT cable glands</td>
<td></td>
</tr>
</tbody>
</table>
Level instruments
Continuous level measurement - Ultrasonic transmitters

The Probe

Options

Flange adapter for mating 2” NPT or 2” BSP process connections to 3” ANSI, DN 65 PN10, and JIS 10K 3B flanges

The Probe Optional Flange Adapter

The Probe with Optional Mounting Bracket

Dimensional drawings

The Probe connections

Schematics

3 Wire Model
(Standard and Sanitary Models)

2 Wire Model
(Standard and Sanitary Models)

Display

The Probe dimensions

Flange adapter for mating 2” NPT or 2” BSP process connections to 3” ANSI, DN 65 PN10, and JIS 10K 3B flanges

The Probe with Optional Mounting Bracket

THE PROBE

148.8 mm (5.86")

190.2 mm (7.49")

Dimensions:

148.8 mm (5.86")

190.2 mm (7.49")

The Probe connections

Siemens FI 01 · 2010
Overview

SITRANS Probe LU is a 2-wire loop powered ultrasonic transmitter for level, volume and flow monitoring of liquids in open channels, storage vessels and simple process vessels.

Benefits

- Continuous level measurement up to 12 m (40 ft) range
- Easy installation and simple start-up
- Programming using infrared Intrinsically Safe handheld programmer, SIMATIC PDM or HART® Communicator
- Communication using HART or PROFIBUS PA
- ETFE or PVDF transducers for chemical compatibility
- Patented Sonic Intelligence signal processing
- Extremely high signal-to-noise ratio
- Auto False-Echo Suppression for fixed obstruction avoidance
- Level to volume or level to flow conversion

Application

The SITRANS Probe LU is ideal for level monitoring in the water and wastewater industry and chemical storage vessels.

The range of SITRANS Probe LU is 6 or 12 m (20 or 40 ft). Using Auto False-Echo Suppression for fixed obstruction avoidance, as well as an improved signal-to-noise ratio and improved accuracy of 0.15% of range or 6 mm (0.25"), the Probe LU provides unmatched reliability.

SITRANS Probe LU includes Sonic Intelligence® signal processing from the field-proven Probe and incorporates new echo processing features and the latest micro-processor and communications technology. The Probe LU offers two communications options: HART or PROFIBUS PA (Profile version 3.0, Class B).

The transducer on the Probe LU is available as ETFE or PVDF to suit the chemical conditions of your application. As well, for applications with varying material and process temperatures, the Probe LU incorporates an internal temperature sensor to compensate for temperature changes.

- Key Applications: chemical storage vessels, filter beds, liquid storage vessels

Configuration

Parabolic Mounting

Flat Mounting and Beam Angle
### Technical Specifications

**Mode of operation**

<table>
<thead>
<tr>
<th>Measuring principle</th>
<th>Level measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical application</td>
<td>Level measurement in storage vessels and simple process vessels</td>
</tr>
</tbody>
</table>

**Inputs**

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>6 m (20 ft) model</th>
<th>12 m (40 ft) model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>0.25 to 6 m (10” to 20 ft)</td>
<td>0.25 to 12 m (10” to 40 ft)</td>
</tr>
</tbody>
</table>

**Outputs**

<table>
<thead>
<tr>
<th>mA/HART®</th>
<th>Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 to 20 mA</td>
<td>± 0.02 mA</td>
</tr>
</tbody>
</table>

**Performance**

| Resolution | ≤ 3 mm (0.12”) |
| Accuracy   | ± the greater of 0.15 % of range or 6 mm (0.24”) |
| Repeatability | ≤3 mm (0.12”) |
| Blanking distance | 0.25 m (10") |
| Update time | ≤ 5 seconds |
| 4/20 mA/HART version | ≤ 5 seconds at 4 mA |
| PROFIBUS version | ≤ 4 seconds at 15 mA current loop |
| Temperature compensation | Built-in to compensate over temperature range |
| Beam angle | 10° |

**Rated operating conditions**

- **Ambient conditions**
  - Location: Indoor/outdoor
  - Ambient temperature: -40 to +80 °C (-40 to +176 °F)
  - Relative humidity/ingress protection: Suitable for outdoor
  - Installation category: I
  - Pollution degree: 4
  - Medium conditions
    - Temperature at flange or threads: -40 to +85 °C (-40 to +185 °F)
    - Pressure (vessel): 0.5 bar g (7.25 psi g)

**Design**

| Material (enclosure) | PBT (Polybutylene Terephthalate) |
| Degree of protection | Type 4X/NEMA 4X, Type 6/ NEMA 6/IP67/IP68 enclosure |
| Weight | 2.1 kg (4.6 lbs) |
| Cable inlet | 2 x M20x1.5 cable gland or 2 x ½” NPT thread |
| Material (transducer) | ETFE (Ethylene Tetrafluoroethylene) or PVDF (Polyvinylidene Fluoride) |

**Process connection**

- Threaded connection: 2” NPT (Taper), ANSI/ASME B1.20.1, R 2” [BSPT], EN 10226, or G 2” [BSPP], EN ISO 228-1
- Flange connection: 3” (80 mm) universal flange
- Other connection: FMS 200 mounting bracket (see page 5/185) or customer supplied mount

**Display and Controls**

- Interface: Local: LCD display with bargraph
- Remote: Available via HART or PROFIBUS PA

**Configuration**

- Using Siemens SIMATIC PDM (PC) or HART handheld communicator or Siemens infra-red handheld programmer

**Memory**

- Non-volatile EEPROM

**Power supply**

- 4 to 20 mA/HART: Nominal 24 V DC with 550 Ω maximum; maximum 30 V DC 4 to 20 mA
- PROFIBUS PA: 12, 13, 15, or 20 mA depending on programming (General Purpose or Intrinsically Safe version) per IEC 61158-2

**Certificates and Approvals**

- **General**
  - Marine (only applies to HART communication option)
  - CSAUS/C, FM, CE, C-TICK

- **Hazardous**
  - Intrinsically Safe (Europe) ATEX II 1G Ex ia IIC T4
  - Intrinsically Safe (USA/Canada) CSA/FM (barrier required) T4, Class I, Div. 1, Groups A, B, C, D, Class II, Div. 1, Groups E, F, G; Class III
  - Intrinsically Safe (Australia/New Zealand) ANZEx Ex ia IIC T4, Tamb = -40 to +80 °C (-40 to +176 °F) IP67, IP68
  - Intrinsically Safe (International) IECEx TSA 04.0020X Ex ia IIC T4
  - Non-incendive (USA) FM (no barrier required) TS: Class I, Div. 2, Groups A,B,C, D

**Handheld Programmer**

- Intrinsically Safe Siemens handheld programmer
- Approvals for handheld programmer

**Handheld Programmer**

- Infrared receiver

**Material (transducer)**

- IS model with ATEX Ex ia IIC T4
- CSA/FM Class I, Div. 1, Groups A, B, C, D
- Ambient temperature: -20 to +40 °C (-5 to +104 °F)
- Interface
- Power

- Proprietary infrared pulse signal 3 V lithium battery (non-replaceable)
Level instruments
Continuous level measurement - Ultrasonic transmitters

SITRANS Probe LU

<table>
<thead>
<tr>
<th>Selection and Ordering data</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITRANS Probe LU</td>
<td>C) 7ML5221 -</td>
</tr>
</tbody>
</table>

2-wire, loop powered ultrasonic transmitter for level, volume and flow monitoring of liquids in open channels, storage vessels and simple process vessels.

Enclosure/Cable Inlet
Plastic (PBT), 2 x M20x1.5 (check Approvals for cable gland details)
Plastic (PBT), 2 x ½" NPT (no cable glands supplied)

Range/Transducer material
6 meter (20 ft), ETFE
6 meter (20 ft), PVDF Copolymer
12 meter (40 ft), ETFE
12 meter (40 ft), PVDF Copolymer

Process connection
2" NPT ([Taper], ANSI/ASME B1.20.1)
R 2" ([BSPT], EN 10226)
G 2" ([BSPP], EN ISO 228-1)

Communication/Output
4 to 20 mA, HART®
PROFIBUS PA

Approvals
General Purpose, FM, CSA, CE, C-TICK
Intrinsically Safe, FM Class I, Div. 1, Groups A, B, C, D (barrier required);
Class II, Div. 1, Groups E, F, G;
Class III; ATEX II 1G EEex ia IIC T4, ANZEx;
IECEx (HART model only)
Intrinsically Safe, CSA Class I, Div. 1, Groups A, B, C, D (barrier required);
Class II, Div. 1, Group G;
Class III (HART model only)
FM, Class I, Div. 2 (Enclosure option 2 only)
Intrinsically Safe, CSA/FM Class I, Div. 1, Groups A, B, C, D (barrier required);
Class II, Div. 1, Groups E, F, G, Class III (PROFIBUS PA model only)
Intrinsically Safe, ATEX II 1G EEex ia IIC T4 (PROFIBUS PA model only)

Further designs
Please add "-Z" to Order No. and specify Order code(s).
Stainless steel tag [69 x 50 mm (2.71 x 1.97")]:
Measuring-point number/identification (max. 16 characters) specify in plain text

Operating Instructions for HART/mA device
<table>
<thead>
<tr>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>English C) 7ML1998-5HT02</td>
</tr>
<tr>
<td>French C) 7ML1998-5HT11</td>
</tr>
<tr>
<td>German C) 7ML1998-5HT32</td>
</tr>
</tbody>
</table>

Note: The Operating Instructions should be ordered as a separate item on the order.

Operating Instructions for PROFIBUS PA device
<table>
<thead>
<tr>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>English C) 7ML1998-5JB02</td>
</tr>
<tr>
<td>German C) 7ML1998-5JB32</td>
</tr>
</tbody>
</table>

Additional Multi-language Quick Start manual

Additional Multi-language Quick Start manual

Optional equipment
Handheld programmer, Intrinsically Safe, EEx ia 7ML5830-2AH
Handheld programmer, General Purpose approvals 7ML5830-2AN
Handheld programmer, Infrared, Intrinsically Safe, PROFIBUS PA 7ML5830-2AJ
HART modem/RS-232 (for use with PC and SIMATIC PDM) D) 7MF4997-1DA
HART modem/USB (for use with a PC and SIMATIC PDM) D) 7MF4997-1DB
2" NPT locknut, plastic 7ML1830-1DT
2" BSPT locknut, plastic 7ML1830-1DQ
3" ASME, DN 65 PN 10, JIS 10K 3B ETFE Flange adapter for 2" NPT 7ML1830-1BT
3" ASME, DN 65 PN 10, JIS 10K 3B Flange adapter for 2" BSPT 7ML1830-1BU
One General Purpose polymeric cable gland M20x1.5, rated -40 to +80 °C (-40 to +176 °F) 7ML1930-1AM
One metallic cable gland M20x1.5, rated -40 to +80 °C (-40 to +176 °F) for General Purpose or ATEX EEex e installations (available for HART only) 7ML1930-1AP
One metallic cable gland M20x1.5, rated -40 to +80 °C (-40 to +176 °F) with integrated shield connection (available for PROFIBUS PA) 7ML1930-1AQ
SITRANS RD100 Remote display - see RD100 on page 5/304
SITRANS RD200 Remote display - see RD200 on page 5/306

Spare Parts
Plastic lid 7ML1830-1KB

Options

Flange adapter for mating 2" NPT or 2" BSP process connections to 3" ANSI, DN 65 PN10, and JIS 10K 3B flanges

SITRANS Probe LU optional flange adapter

SITRANS Probe LU with FMS 200 Mounting Bracket

SITRANS Probe LU with optional mounting bracket
Level instruments
Continuous level measurement - Ultrasonic transmitters

SITRANS Probe LU

Dimensional drawings

Note: Above model is shown without M20 cable glands or 1/2" NPT conduit connectors.

SITRANS Probe LU dimensions

Schematics

Notes:
- HART model above is shown with M20 cable glands. 1/2" NPT threaded connection is also available.
- DC terminal shall be supplied from an SELV source in accordance with IEC-1010-1 Annex H.
- All field wiring must have insulation suitable for rated input voltages.
- Separate cables and conduit may be required to conform to standard instrumentation wiring practices or electrical codes.

SITRANS Probe LU connections